Supplement to The Wireless & Electrical Trader, November 15, 1947

"TRADER" SERVICE SHEET

837

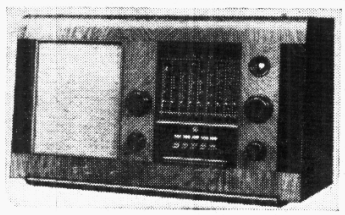
EKCO A28

9-Band & P.B. Superhet

BAND-SPREAD tuning on seven S.W. bands, a television channel, M.W. and L.W., are provided on the Ekco A28, a four-valve (plus rectifier) A.C. superhet designed for mains of 200-250V, 40-80 c/s.

A tenth position on the band switch control brings in press-button tuning. S.W. ranges are in 13m, 16m, 19m, 25m, 31m, 41m and 49m bands (bands 1-7). The television channel is accommodated on band 1. A cathode-ray tuning indicator is fitted. Tone control is associated with the negative feed-back system.

Release date and original price: August, 1946; £29 8s plus £6 6s 5d p.t., increased December, 1946, to £31 10s plus £6 15s 6d p.t.



CIRCUIT DESCRIPTION

On M.W. and L.W., aerial is inductively coupled to single-tuned circuits **L4** (M.W.) and **L5** (L.W.), tuned manually by **C46**, which precede triode-hexode valve **(V1, Mullard metallized ECH35)**, operating as frequency changer with internal coupling. Triode oscillator anode coils **L16** (M.W.) and **L17** (L.W.) are tuned by **C51**.

For automatic tuning in the aerial circuit, **C46** is replaced by pre-set trimmer type capacitors **C52-C56**, selection being achieved by press-button switches **S1a, b** to **S5a, b, x**, which are coded in accordance with our normal practice. In the oscillator circuit the P.B. master coil **L38** is shunted by one of the pre-set iron-dust cored coils **L33-L37**, tuned by **C13**, and selected by switches **S1c** to **S5c, y**.

On S.W., band 7, **L12** (aerial) and **L24** (oscillator) are permeability tuned by ganged iron-dust cores, **C46** and **C51** being disconnected. For the remaining six S.W. bands the appropriate coils are shunted across **L12** and **L24**, which then become ganged master tuning coils.

The television sound channel (T.S.) is tuned by **L13, C6** in the aerial circuit, and a second harmonic is used in the oscillator circuit, the receiver being tuned to approximately 13.99m.

Second valve (**V2, Mullard metallized EF39**) is a variable-mu R.F. pentode operating as I.F. amplifier.

Intermediate frequency 460 kc/s.

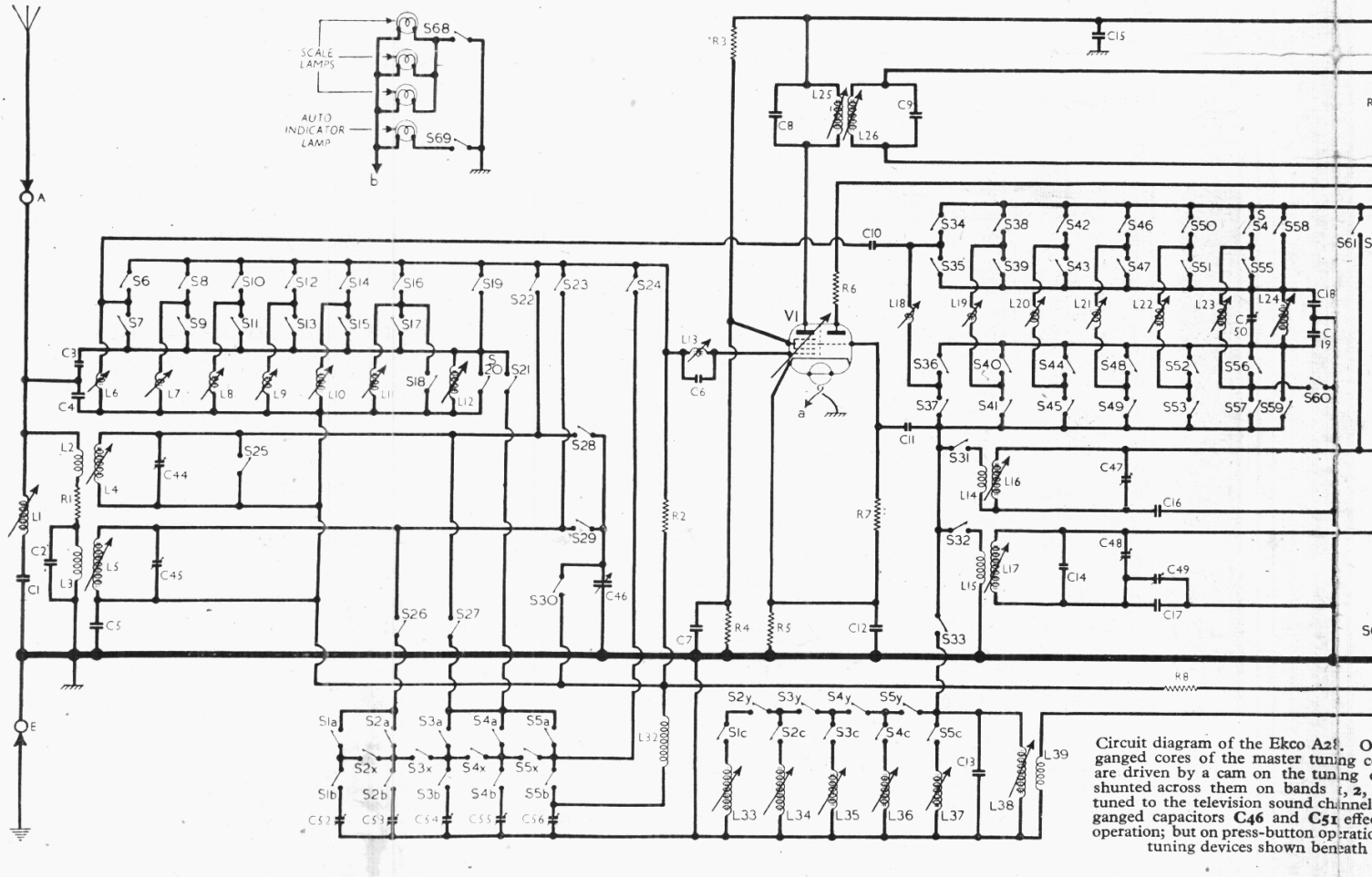
Diode second detector is part of double diode triode valve (**V3, Mullard EBC33**), the second diode of which provides A.V.C. voltages.

Resistance capacitance coupling is employed between **V3** triode and pentode output valve **(V4, Mullard EL33)**. Voltages developed across the feed-back winding **f, g,** of the output transformer **T1**, are fed back to **V3** triode grid circuit via the manual tone control **R34**.

H.T. current is supplied by full-wave rectifying valve **(V5, Mullard AZ31)**.

COMPONENTS AND VALUES

	RESISTORS	Values (ohms)	Location
R1	Aerial damping ...	330	L10
R2	V1 hex. C.G. ...	4,700,000	L12
R3	V1 S.G. H.T. potential divider ...	33,000	H7
R4		33,000	G7
R5	V1 fixed G.B. ...	270	H7
R6	Osc. stabiliser ...	15	G6
R7	V1 osc. C.G. ...	47,000	G7
R8	A.V.C. decoupling	100,000	H8
R9	V1 osc. anode H.T. feed ...	47,000	M12
R10		47,000	M12
R11	V2 S.G. feed ...	100,000	G9
R12	V2 fixed G.B. ...	330	G8
R13	V2 H.T. decoup. ...	2,200	H7
R14	T.I. triode anode load resistors ...	1,500,000	A2
R15		6,800,000	A2
R16	T.I. C.G. feed ...	3,300,000	H8
R17	I.F. stopper ...	47,000	I8
R18	V3 sig. diode load...	220,000	I8
R19	Part. tone corrector	220,000	J5
R20	Volume control ...	1,000,000	J5
R21	I.F. stopper ...	1,000,000	C3
R22	A.V.C. decoupling	1,500,000	H8
R23	V3 G.B. and A.V.C. delay	1,000	I8
R24	V3 anode load ...	47,000	H7
R25	A.V.C. diode load...	220,000	H9
R26		1,500,000	H9
R27	V4 C.G.	220,000	I8
R28	H.T. potential divider ...	10,000	H7
R29		68,000	G9
R30	V4 S.G. stopper ...	100	I7
R31	V4 C.G. stopper ...	47,000	I8
R32	V4 G.B.	150	I7
R33	V4 anode stopper...	100	I8
R34	Tone control ...	500,000	E2
R35	Part feed-back potential divider	15,000	J9
R36		47,000	E2
R37		470	J5



Circuit diagram of the Ekco A28. O ganged cores of the master tuning c are driven by a cam on the tuning shunted across them on bands 1, 2, tuned to the television sound channel ganged capacitors **C46** and **C51** effe operation; but on press-button operatio tuning devices shown beneath

CAPACITORS		Values (μF)	Location
C1	I.F. filter tuning ...	0·00015	L12
C2	Aerial L.W. shunt	0·00082	L10
C3	Aerial S.W. coupling ...	0·000068	L12
C4	Aerial S.W. coupling ...	0·00047	L12
C5	V1 hex. C.G. decoup.	0·05	G7
C6	T.S. tuning ...	0·00002	G8
C7	V1 S.G. decoup. ...	0·1	G7
C8	1st I.F. transformer tuning ...	0·00015	D3
C9	1st I.F. transformer tuning ...	0·00015	D3
C10	Neutralising ...	0·000001	M12
C11	V1 osc. C.G. ...	0·000047	G6
C12	V1 cath. by-pass ...	0·1	H6
C13	P.B. osc. tuning ...	0·00027	G6
C14	L.W. fixed trim. ...	0·00006	M10
C15	H.T. R.F. by-pass	0·1	H7
C16	M.W. tracker ...	0·00056	M10
C17	L.W. fixed track....	0·00019	M10
C18	Osc. S.W. fixed tuning ...	0·00015	M12
C19	Osc. S.W. fixed tuning ...	0·00015	M12
C20	Osc. anode coup. ...	0·0001	M12
C21	V2 C.G. decoup. ...	0·05	H8
C22	V2 S.G. decoup. ...	0·1	G9
C23	V2 H.T. decoup. ...	0·1	G9
C24	2nd I.F. transformer tuning ...	0·0001	D3
C25	2nd I.F. transformer tuning ...	0·00022	D3
C26	V2 cath. by-pass ...	0·1	G9
C27	T.I. C.G. decoup....	0·01	A2
C28	I.F. by-passes ...	0·0001	H8
C29	I.F. by-passes ...	0·0001	H8
C30*	V3 cath. by-pass ...	25·0	K7
C31	A.V.C. coupling ...	0·000015	H8
C32	A.F. coupling ...	0·02	I7
C33	"Top" boost ...	0·0001	K5
C34	I.F. by-pass ...	0·00005	C3
C35	A.F. coupling ...	0·05	I7
C36*	V3 H.T. decoupling	4·0	H9
C37	Tone corrector ...	0·0025	I8
C38*	V4 cath. by-pass...	25·0	K7
C39	Het. filter tuning ...	0·005	K8
C40	Part variable tone control ...	0·002	K5
C41	Part variable tone control ...	0·1	E2

(*Continued next col.*)

* Electrolytic.

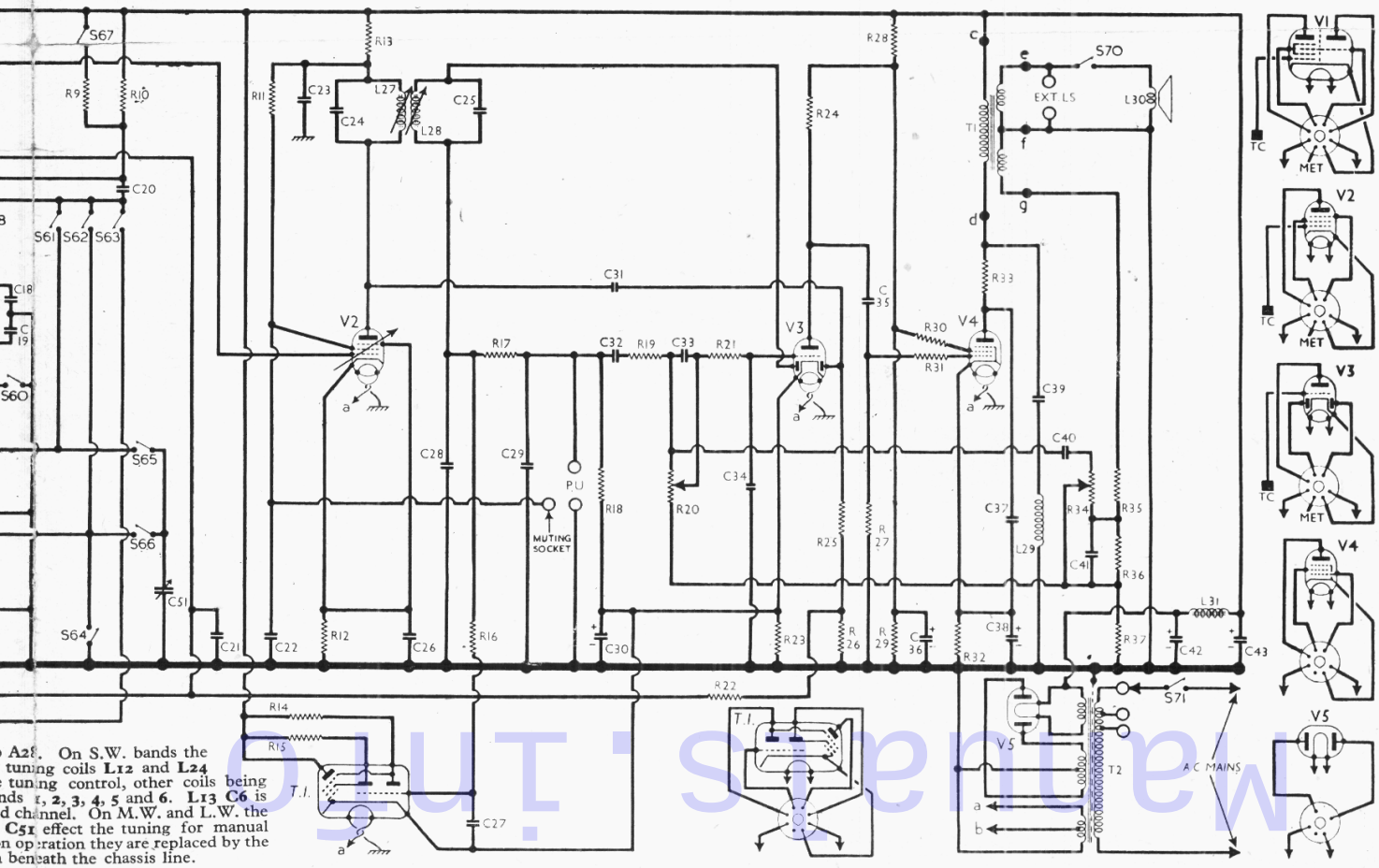
CAPACITORS (*continued*)		Values (μF)	Location
C42*	H.T. smoothing ...	8·0	A2
C43*	H.T. smoothing ...	16·0	A2
C44‡	Aerial M.W. trim....	—	L10
C45‡	Aerial L.W. trim....	—	L10
C46†	Aerial tuning ...	—	C3
C47‡	Osc. M.W. trim. ...	—	M10
C48‡	Osc. L.W. trim. ...	—	M10
C49‡	Osc. L.W. track. ...	—	L10
C50‡	Osc. S.W. trim. ...	—	M10
C51†	Osc. tuning ...	—	C2
C52‡	Aerial circuit press-button tuning trimmers ...	0·00055	I5
C53‡	Aerial circuit press-button tuning trimmers ...	0·00027	I5
C54‡	Aerial circuit press-button tuning trimmers ...	0·00055	H5
C55‡	Aerial circuit press-button tuning trimmers ...	0·00027	H5
C56‡	Aerial circuit press-button tuning trimmers ...	0·00013	G5

* Electrolytic. † Variable. ‡ Pre-set.

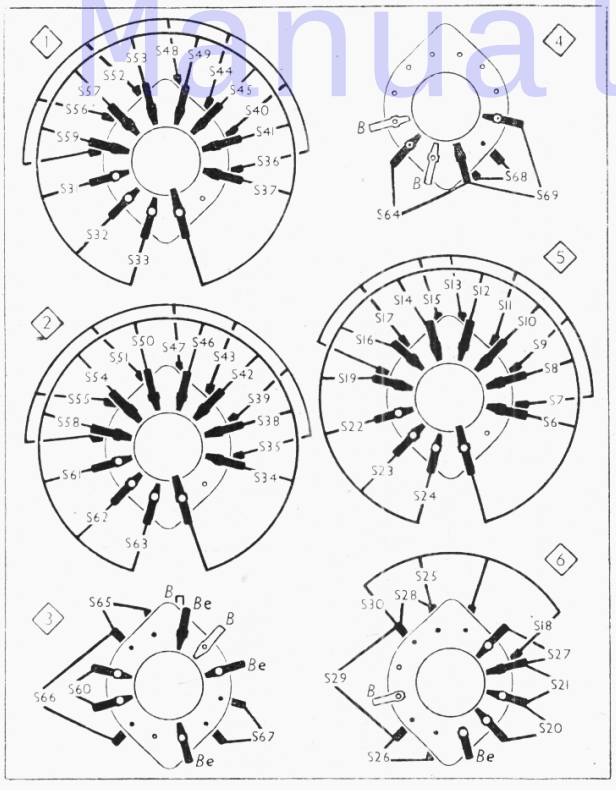
OTHER COMPONENTS		Approx. Values (ohms)	Location
L1	I.F. filter coil ...	8·0	L12
L2	Aerial coupling coils ...	9·5	L10
L3	Aerial coupling coils ...	32·0	L10
L4	Aerial tuning coils	4·5	L10
L5	Aerial tuning coils	26·0	L10
L6	Aerial S.W.1 coil ...	Very low	L11
L7	Aerial S.W.2 coil ...	Very low	L11
L8	Aerial S.W.3 coil ...	Very low	L11
L9	Aerial S.W.4 coil ...	Very low	L11
L10	Aerial S.W.5 coil ...	0·1	L11
L11	Aerial S.W.6 coil ...	0·2	L11
L12	Aerial band-spread master coil ...	0·8	D2
L13	T.S. tuning coil ...	Very low	G8
L14	Osc. reaction coils...	1·0	M10
L15	Osc. reaction coils...	2·5	M10
L16	Osc. tuning coils ...	2·2	M10
L17	Osc. tuning coils ...	4·5	M10

(*Continued next col.*)

OTHER COMPONENTS (*Continued*)		Approx. Values (ohms)	Location
L18	Osc. S.W.1 coil ...	Very low	M11
L19	Osc. S.W.2 coil ...	Very low	M11
L20	Osc. S.W.3 coil ...	Very low	M11
L21	Osc. S.W.4 coil ...	Very low	M11
L22	Osc. S.W.5 coil ...	0·1	M11
L23	Osc. S.W.6 coil ...	0·2	M11
L24	Osc. band-spread master coil ...	0·7	D2
L25	1st I.F. trans. Pri.	9·0	D3
L26	1st I.F. trans. Sec.	9·0	D3
L27	2nd I.F. trans. Pri. ...	14·0	D3
L28	2nd I.F. trans. Sec. ...	7·0	D3
L29	Het. filter coil ...	215·0	K9
L30	Speech coil ...	2·0	—
L31	H.T. choke ...	620·0	J7
L32	Osc. circuit press-button tuning coils ...	16·0	G6
L33	Osc. circuit press-button tuning coils ...	6·5	I6
L34	Osc. circuit press-button tuning coils ...	5·5	I6
L35	Osc. circuit press-button tuning coils ...	3·5	H6
L36	Osc. circuit press-button tuning coils ...	3·5	H6
L37	Osc. circuit press-button tuning coils ...	1·8	H6
L38	P.B. master osc. coils ...	9·0	G6
L39	P.B. master osc. coils ...	3·0	G6
T1	Output trans. Pri. ...	334·0	J9
T1	Output trans. Spkr. sec.	0·3	J9
T1	Output trans. F.B. sec.	42·0	J9
T2	Mains trans. Pri., total	43·0	B4
T2	Mains trans. Heat sec.,	Very low	B4
T2	Mains trans. Rect. heat. sec. ...	0·1	B4
T2	Mains trans. H.T. sec., total ...	580·0	B4
S1a, b to S5a, b, x	Aerial press-button switches ...	—	—
S1c, to S5c, y	Oscillator press-button switches	—	—
S6-S69	Waveband switches	—	—
S70	Int. speaker switch	—	I9
S71	Mains switch, ganged R20 ...	—	K6



A28. On S.W. bands the tuning coils **L12** and **L24** tuning control, other coils being nds **1**, **2**, **3**, **4**, **5** and **6**. **L13** **C6** is d channel. On M.W. and L.W. the **C51** effect the tuning for manual n operation they are replaced by the beneath the chassis line.



Above: Diagrams of the six waveband switch units, viewed over the **A** and **E** sockets. *Right:* the associated switch table, in which band 1 is represented by S.W.1, etc. M.W. is band 8, and L.W. band 9.

Switch	S.W.1	S.W.2	S.W.3	S.W.4	S.W.5	S.W.6	S.W.7	M.W.	L.W.	Aut
S6	C	—	—	—	—	—	—	—	—	—
S7	C	—	—	—	—	—	—	—	—	—
S8	—	C	—	—	—	—	—	—	—	—
S9	—	C	—	—	—	—	—	—	—	—
S10	—	—	C	—	—	—	—	—	—	—
S11	—	—	C	—	—	—	—	—	—	—
S12	—	—	—	C	—	—	—	—	—	—
S13	—	—	—	C	—	—	—	—	—	—
S14	—	—	—	—	C	—	—	—	—	—
S15	—	—	—	—	C	—	—	—	—	—
S16	—	—	—	—	—	C	—	—	—	—
S17	—	—	—	—	—	C	—	—	—	—
S18	—	—	—	C	C	—	—	—	—	—
S19	—	—	—	—	—	—	C	—	—	—
S20	—	—	—	—	—	—	—	C	—	—
S21	—	—	—	—	—	—	—	—	C	—
S22	—	—	—	—	—	—	—	C	—	—
S23	—	—	—	—	—	—	—	—	C	—
S24	—	—	—	—	—	—	—	—	—	C
S25	—	—	—	—	C	C	C	—	—	—
S26	—	—	—	—	—	—	—	—	—	C
S27	—	—	—	—	—	—	—	—	—	C
S28	—	—	—	—	—	C	C	C	—	—
S29	—	—	—	—	—	—	—	—	C	—
S30	—	—	—	—	—	C	C	—	—	—
S31	—	—	—	—	—	—	—	C	—	—
S32	—	—	—	—	—	—	—	—	C	—
S33	—	—	—	—	—	—	—	—	—	C
S34	C	—	—	—	—	—	—	—	—	—
S35	C	—	—	—	—	—	—	—	—	—
S36	C	—	—	—	—	—	—	—	—	—
S37	C	—	—	—	—	—	—	—	—	—
S38	—	C	—	—	—	—	—	—	—	—
S39	—	C	—	—	—	—	—	—	—	—
S40	—	C	—	—	—	—	—	—	—	—
S41	—	C	—	—	—	—	—	—	—	—
S42	—	—	C	—	—	—	—	—	—	—
S43	—	—	C	—	—	—	—	—	—	—
S44	—	—	C	—	—	—	—	—	—	—
S45	—	—	C	—	—	—	—	—	—	—
S46	—	—	—	C	—	—	—	—	—	—
S47	—	—	—	C	—	—	—	—	—	—
S48	—	—	—	C	—	—	—	—	—	—
S49	—	—	—	C	—	—	—	—	—	—
S50	—	—	—	—	C	—	—	—	—	—
S51	—	—	—	—	C	—	—	—	—	—
S52	—	—	—	—	C	—	—	—	—	—
S53	—	—	—	—	C	—	—	—	—	—
S54	—	—	—	—	—	C	—	—	—	—
S55	—	—	—	—	—	C	—	—	—	—
S56	—	—	—	—	—	C	—	—	—	—
S57	—	—	—	—	—	C	—	—	—	—
S58	—	—	—	—	—	—	C	—	—	—
S59	—	—	—	—	—	—	C	—	—	—
S60	C	C	—	—	—	—	—	—	—	—
S61	—	—	—	—	—	—	—	C	—	—
S62	—	—	—	—	—	—	—	—	C	—
S63	—	—	—	—	—	—	—	—	—	C
S64	—	—	—	—	—	—	—	C	—	—
S65	—	—	—	—	—	C	C	—	—	—
S66	—	—	—	—	—	—	—	—	C	—
S67	C	C	C	C	C	C	C	C	C	—
S68	C	C	C	C	C	C	C	C	C	—
S69	—	—	—	—	—	—	—	—	—	C

VALVE ANALYSIS

Valve voltages and currents given in the table below are those measured in our receiver when it was operating on mains of 230 V.

Voltages were measured on the 400 V scale of a model 7 Universal Avometer, chassis being the negative connection.

Valve	Anode Voltage (V)	Anode Current (mA)	Screen Voltage (V)	Screen Current (mA)
V1 ECH35	280	1·7	94	1·9
	Oscillator			
	91	3·2		
V2 EF39	261	4·1	94	1·5
V3 EBC33	89	1·7	—	—
V4 EL33	267	26·0	190	2·9
V5 AZ31	303†	—	—	—
T.I. EM34	12	0·04 (Pin 3)		—
	32	0·18 (Pin 6)		
	Target			
	280	1·5 (Pin 5)		

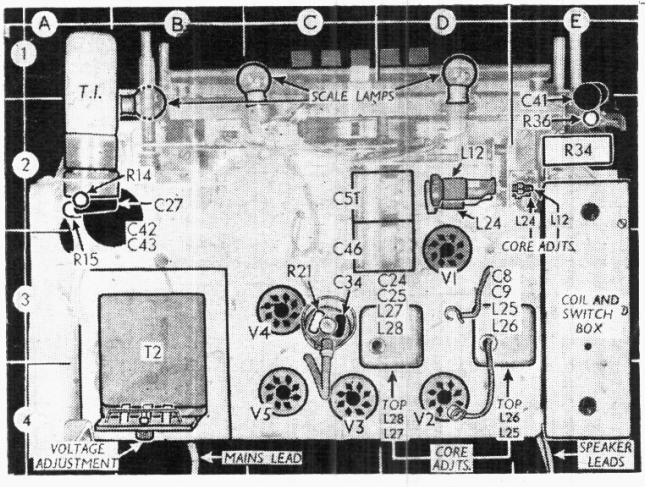
† Each anode, A.C.

DISMANTLING THE SET

Removing Chassis.—Remove the four control knobs (grub screws and felt washers); from the rear of cabinet remove the two round-head wood screws securing the heat deflector plate close to **T2**; slide out the **T1** valve from its retaining clamp; remove the four 2 B.A. cheese-head screws securing the chassis to the base of the cabinet, and slide out the chassis to the extent of the speaker leads.

Removing Speaker.—Loosen the nuts of the four speaker-retaining clamps, and lift out speaker.

When replacing, the connecting panel should be at the top.



Plan view of the chassis. The ganged inductive tuner **L12, L24** is driven by a cam on the spindle of the capacitative gang **C46, C51. R21, C34** are in the top cap connector of **V3**. The top of the coil unit is seen on the right; an interior view appears in col. 4.

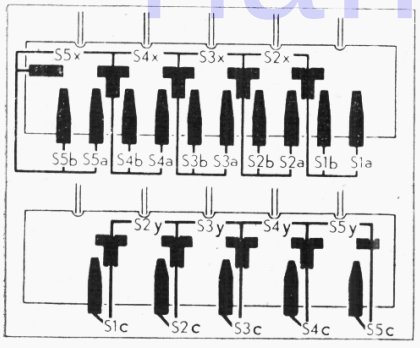
GENERAL NOTES

Switches.—The first group of switches **S1-S5** comprises all the switches in the press-button unit, coded with suffixes **a, b, x,** etc. This was fully explained in *Service Sheet* 786 on the Ekco A21. The press-buttons cannot be operated unless the main waveband control is at the "auto" position (fully clockwise), as a sliding link holds the latch-bar at the "release."

The unit may be freed if the left-hand button is pulled off its plunger (heated by a soldering iron) and the fixing screws are removed, when it may be turned over for inspection. When replacing, it is important to ensure that the latch-bar release link engages the edge of the cam on the waveband switch spindle. Diagrams are shown in col. 4.

The second group consists of **S6-S69.** These are the waveband switches, in a ten-position rotary assembly containing six units, located at the bottom of the coil and switch box in whose illustration (col. 4) the units are identified by numbers in diamonds.

The units are shown in detail in the diagrams in col. 1, and the associated table is in cols. 2 and 3 beside them. In the table, a dash indicates open, and **C** closed. In the tenth



Diagrams of both sides of the P.B. switch unit. Above, as seen in our under-chassis view; below, as seen when turned over on its leads.

(fully clockwise) position, the press-button system is brought into circuit.

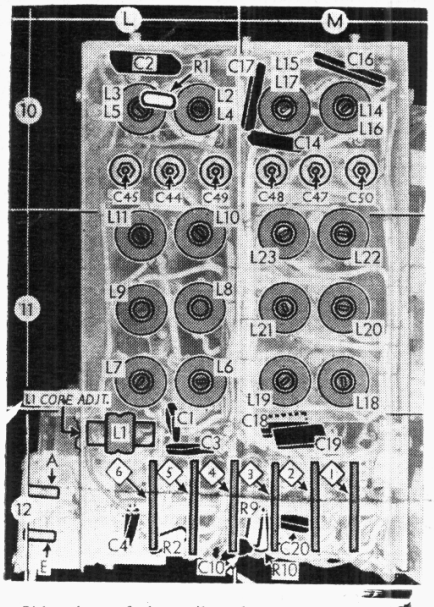
The remaining two switches are the speaker muting switch **S70** and the mains switch **S71**, the latter being ganged with **R20.**

Coils.—The positions of all components are indicated by location references in the tables. All the press-button coils are grouped round the P.B. unit. With the exception of the television sound channel coil **L13** and the I.F. transformers, all remaining tuning coils are in the coil and switch box, which is shown in the separate illustration below, viewed from the end of a chassis standing upright.

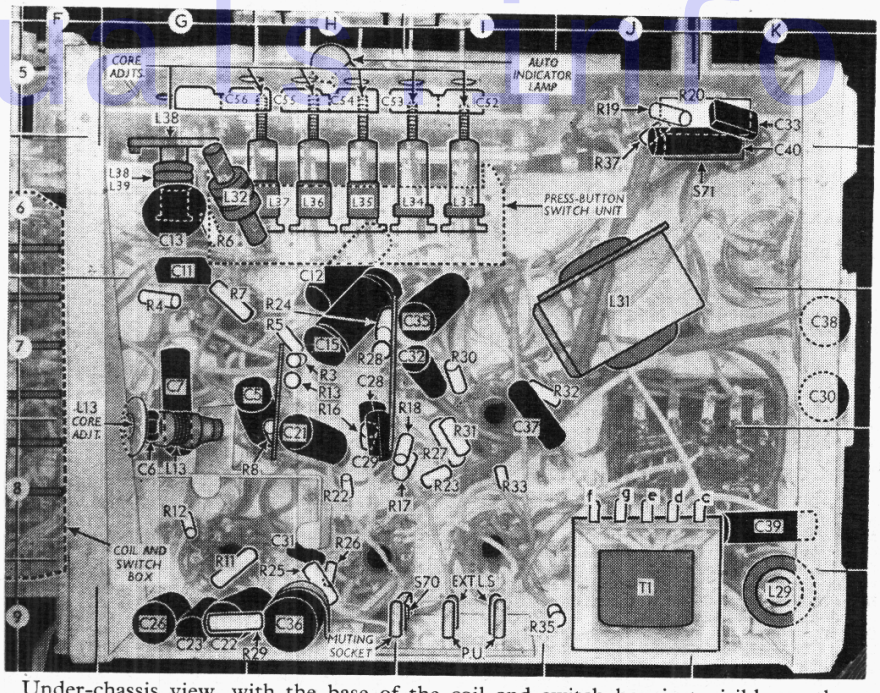
External Speaker.—Two sockets are provided at the rear of the chassis for a low impedance (3-4Ω) external speaker. Switch **S70** is provided to units the internal speaker if desired.

Muting Socket.—This is provided for muting radio when using a gramophone pick-up. Muting is effected by connecting this socket to chassis.

Scale and Indicator Lamps.—These are four Osram lamps, with large spherical bulbs and M.E.S. bases, rated at 6.2 V, 0.3 A. The auto indicator lamp has a frosted bulb, but the others are clear.



Side view of the coil and switch box, with coverplate removed. Each coil unit has an adjustable core. **C50**, at the end of the row of capacitative trimmers, should not be disturbed. The waveband switch units (bottom) are shown in detail in col. 1.



Under-chassis view, with the base of the coil and switch box just visible on the left. The tags of **T1** are lettered to agree with the circuit diagram overleaf. The P.B. coils are shown "through" the P.B. switch unit, which is indicated by a dotted outline. Diagrams of this unit appear on the left, in col. 4.

CIRCUIT ALIGNMENT

I.F. Stages.—Switch set to M.W. (band 8), turn gang and volume control to maximum, connect signal generator, via an 0.1μF capacitor in live lead, to control grid (top cap) of **V1** and chassis, feed in a 460 kc/s (652.1m) signal, and adjust the cores of **L28, L27, L26** and **L25** (location reference D3) in that order for maximum output.

P.B. Circuit.—The specified wavelength coverage of each oscillator press-button coil is dependent upon accurate setting of the core adjustment of the P.B. master coil **L38.** Switch to band 10, release all buttons, feed in a 312.5m (960 kc/s) signal, and adjust the core of **L38** (G6) for maximum output.

I.F. Filter.—Transfer signal generator leads to **A** and **E** sockets, via a suitable dummy aerial, feed in a 460 kc/s signal, and adjust the core of **L1** (L12) for minimum output.

R.F. and Oscillator Stages.—With the gang at maximum the pointers should coincide with the orange-coloured horizontal line at the top of the scales. They may be adjusted by removing the metal light excluding plate (three set-screws) and slackening the drive-wire clamp (two set-screws) at the rear of the pointer carriage.

M.W.—With set switched to M.W. (band 8) tune to 250m on scale, feed in a 250m (1,200 kc/s) signal and adjust **C47** (M10) for maximum output. Tune to 230m on scale, feed in a 230m (1,304 kc/s) signal, and adjust **C44** (L10) for maximum output. Tune to 500m on scale, feed in a 500m (600 kc/s) signal and adjust the cores of **L16** (M10) and **L4** (L10) for maximum output. Repeat adjustments until no improvement results.

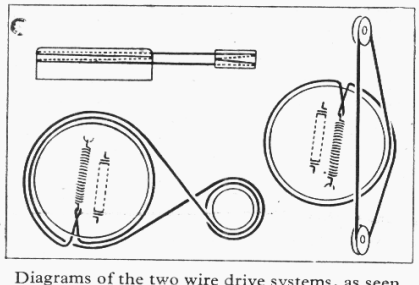
L.W.—Switch set to L.W. (band 9), tune to 1,000m on scale, feed in a 1,000m (300 kc/s signal, and adjust **C48** and **C45** (M10, L10) for maximum output. Tune to 1,400m on scale, feed in a 1,400m (214 kc/s) signal, and adjust the core of **L17** (M10) for maximum output. Tune to 1,800m on scale, feed in an 1,800m (166 kc/s) signal, and adjust **C49** (L10) and the core of **L5** (L10) for maximum output. Repeat adjustments until no improvement results.

Band-spread S.W. Bands.—The following table gives the procedure for the seven S.W. bands, the adjustment in each case consisting only of setting receiver and signal generator scales correctly and then adjusting the appropriate coil cores. In no circumstances must **C50** be disturbed unless it is known to be out of adjustment, when it is essential that **L24** is temporarily replaced by a standard 13.28μH inductance. Otherwise the L/C ratio of **L24, C50** will be upset, and as they form a master circuit, all the S.W. bands will be out of track with their scales. On all S.W. bands, where two peaks are found, use the lower frequency one.

Receiver		Sig. Gen.		Adjustment	
Band	Scale Setting (m)	Wavelength (m)	Frequency (Mc/s)	Cores	Location
7	48·0	48·0	6·3	L24, L12	D2, D2
6	41·2	41·2	7·25	L23, L11	M11, L11
5	31·0	31·0	9·7	L22, L10	M11, L11
4	25·2	25·2	11·9	L21, L9	M11, L11
3	19·7	19·7	15·2	L20, L8	M11, L11
2	16.82	16·82	17·8	L19, L7	M11, L11
1	13·95	13·95	21·5	L18, L6	M11, L11
1	T.S.	7·23	41·5	L13	G8

DRIVE CORD REPLACEMENT

Two drive wires are used, one for the gang drive and one for the pointer. The former is 26ins. long (part No. B32417) and the latter 23⅜ins. (part No. 32417/1). Replacements are supplied by the makers, looped ready to fit. Their



Diagrams of the two wire drive systems, as seen from the front. Left, gang drive (with plan view above it); right, pointer drive.

courses are shown in the diagrams above, where they are viewed from the front with the gang at maximum.

Replacement instructions are very much as in other Ekco receivers, and a full description may be found in Service Sheets 827 and 802.

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